

ELEKTRION

ELECTRON BEAM POWER SUPPLY
Model 4021

ELECTRON BEAM POWER SUPPLY

10 KV Anode Potential, With Focus And Deflection Supplies
Ultra-Stable For Precision Electron Beam Operation

FEATURES

VOLTAGE REGULATED

Anode Voltage Ripple $< 0.005\%$, Regulation $< 0.1\%$,
For High Beam Power Density, Precision Control

CURRENT REGULATED

Focus and Deflection Currents Remain Within 0.1%
No Defocussing or Depositioning due to Normal Heating and Deflection Coils

D-C FILAMENT SUPPLY

No A-C Magnetic Field Distortion of Beam

SCAN CURRENT SOURCES

Stabilized Circular and Linear X-Y Scans

DESCRIPTION

The ELEKTRION Model 4021 Electron Beam Power Supply provides stabilized voltages and currents for the generation, focussing, and deflection of 10 kilovolt electron beams with electron guns such as the ELEKTRION Series 300.

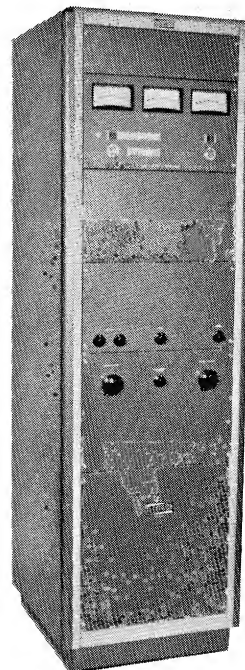
The stability of gun operating potentials and currents and their freedom from ripple and other spurious components are of paramount importance in determining the performance obtainable from an electron gun. The ELEKTRION 4021 was designed to remove limitations of power supply performance on electron beam operation by permitting higher beam energy densities and more precise and stable positioning and scanning of the focussed spot.

The extremely low ripple and high stability of the anode voltage supply make the 4021 useful in many other applications as well.

The Power Supply consists of an electronically regulated and filtered anode voltage supply, a stabilized dc filament supply, current-regulated focus and deflection current sources, and an adjustable linear or circular scan current generator, together with the associated meter indicators and interlock circuits.

The equipment is housed in an enclosed relay rack cabinet which provides room for optional accessory circuit devices. Either local or remote operation can be provided.

Anode Voltage Supply — An electronic voltage regulator circuit in conjunction with a solid-state three-phase bridge rectifier provides long-term stability and high-speed response to transient line and load fluctuations that were previously unavailable in high-power electron beam supplies. The output is adjustable up to — 10,000 volts, at beam currents up to 225 milliamperes continuous duty. Ripple voltage is held to less than 0.005% peak-to-peak for



APPLICATIONS

The 4021 is designed to provide a highly stabilized source of power for ELEKTRION high- and low-power electron guns.

It can also be used to upgrade the performance of existing electron beam installations by replacing power supplies found to be unsuitable because of excessive voltage regulation or ripple, unstable focus and deflection currents, or lack of operating flexibility.

The unusual stability, freedom from ripple, and versatility which it affords make the Model 4021 ideal as a power source for electron beam welding, machining, heating, evaporating, and other processing operations.

It also is an excellent power source for scanning electron microscopes, electron analyzers, and microwave tubes.

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Electron and Ion Sources/Systems/Controls

Vacuum Devices

any current in this range and for any rated line voltage. As a result, beam diameter, and consequently power density, are optimized.

The regulator circuit maintains the anode voltage constant within $\pm 0.2\%$ for any beam current from 0 to 225 milliamperes. This high order of stability permits more accurate and stable positioning of the beam and makes it practical to set up beam workpiece adjustments at low power, with negligible shift in position when current is increased to normal working levels. It also eliminates the need for a tracking focus current supply to compensate for anode voltage instability.

Filament Power Supply — Filtered dc is provided for heating the electron-emitting filament in order to eliminate the spot defocussing caused by magnetic fields associated with ac heating. This supply is stabilized, adjustable, and metered.

Bias Voltage Supply — Negative control-electrode bias for the control of beam current independently of anode voltage and of heater power is provided by an adjustable, stabilized source operating at filament high-voltage potential. Its instantaneous response to changes in control setting permits precise control of beam power.

Focus Current Supply — Special attention has been given to the design of the focus current supply, since this parameter is much more critical with regard to beam diameter (spot size) than is generally realized. Depending on the electron gun design, focus current variations of a fraction of a percent can cause an increase in beam diameter of 2:1 or more, drastically reducing energy density, even though the anode voltage remains constant.

Such variations, whether due to ripple current or instability of dc magnitude, have been minimized in the ELEKTRION solid-state current-regulated supply. The current regulating circuit, unlike the more common voltage-regulating circuit, also compensates for changes in resistance of the focus coil due to self-heating and to radiation from

the workpiece, changes that often exceed 25% to 50%. Thus, the ELEKTRION supply permits uniformly excellent long-time operation without the need for continual readjustment of controls.

Both single and dual supplies (for use with two focus lenses) are available.

As an added convenience in aligning the beam-forming system, an ac focus current source is provided.

Beam Positioning and Scanning Current Supplies — The stability and ripple-free output of the deflection current supplies complement the excellent performance of the ELEKTRION anode and focus supplies. These solid-state current-regulating units permit precise positioning of the beam about the gun axis, with independent X and Y axis controls.

Linear X-Y and circular scanning are accomplished with built-in, stabilized sources of sine-wave scanning currents at power-line frequency.

Protective Features — The 4021 Electron Beam Power Supply is provided with both fuse and relay overload protection. Interlock circuits include cabinet door, high-voltage connectors, and zero-voltage start control, with provision for use of vacuum chamber pressure, coolant flow, and other external interlock circuits. A keylock switch controls the main power to prevent unauthorized operation.

Metering — Large, precision, mirror-scale meters are provided for the indication of anode voltage, filament current, and gun current.

Remote Control — All circuits and controls necessary for operation of the electron gun are normally mounted in the enclosed rack housing of the 4021. Optionally, however, an Electron Beam Remote Control Unit for controls and gun current can be operated at the vacuum chamber or other convenient location.

Housing — The 4021 is housed in a two-tone grey enamelled enclosed relay rack, with power input and output connections at the top.

SPECIFICATIONS

ANODE SUPPLY

Output Voltage (Positive Grounded) Variable, 4,000 to 10,000 Volts
Output Current, Continuous Duty 0 to 225 mA DC
Ripple Voltage < 0.005%
Regulation:
Line: (Any Rated Load)—105-130 V, 1 ϕ ; 190-225 V, 3 ϕ < $\pm 0.1\%$
Load: (Nominal Line)—0-225 mA < $\pm 0.2\%$

FILAMENT SUPPLY 0-10 Volts DC, 30 Amps Max.

BIAS SUPPLY

Output Voltage 0-1000 Volts DC
Ripple < 0.1%

FOCUS CURRENT SUPPLY

Output Current (Max. Coil Resistance 50 Ohms) 0-500 mA
Current Regulation $\pm 0.1\%$
Ripple < 0.01%
Auxiliary Alignment Current 60 Hz

POSITIONING AND DEFLECTION CURRENT SUPPLY

Output Current (DC Plus Peak AC) 0 to ± 200 mA
Current Regulation $\pm 0.1\%$
Ripple < 0.05%
Scanning Signals Adjustable (60Hz Sine Wave) Linear X and/or Y,
or Circular Scan

METERS: Anode Voltage, Filament Current, Gun Current (Dual Range)

INTERLOCKS: Cabinet, HV Connector, Zero Anode Voltage; Provision for Vacuum Chamber Pressure, Water Flow, and Other Auxiliaries

POWER REQUIREMENTS 208 Volts, 3 ϕ , 60Hz
(Other Voltages and Frequencies on Special Order) 117 Volts, 1 ϕ , 60Hz

SIZE 21" W. x 25½" D. x 78" H.

WEIGHT 500 Pounds

Specifications subject to change without notice.